Applicant has amended the claims, particularly to overcome the Examiner's rejection of indefiniteness under 35 U.S.C. §112 and to more clearly distinguish the invention from the prior art cited. The Examiner initially rejected claim 4 under 35 U.S.C. §112, second paragraph. Accordingly, Applicant has amended claim 4 to particularly point out and distinctly claim, in full, clear, concise and exact terms, the subject matter which Applicant regards as his invention.

The Examiner rejected Claims 1, 4-8, 12-13, 15-38, 41 and 43 under 35 U.S.C. §103 as being unpatentable over Shapiro, "Embedded Image Coding Using Zero Trees of Wavelet Coefficients," in view of Woods, "Subband Image Coding," and Ormsby, et. al. The present invention as claimed in Claim 1 requires that an overlapped reversible wavelet transform be applied to input data. The reversible transform comprises an implementation of an exact-reconstruction system integer arithmetic, such that a signal with integer coefficients can be losslessly recovered. Neither Shapiro, Woods nor Ormsby set forth a reversible transform. Therefore, the combination cannot render the present invention obvious.

Shapiro sets forth the use of a discrete wavelet transform. However, the only filters used in his described experiment are 9-tap symmetric quadrature mirror filters (QMF). The Examiner relies on Woods to show that the filter in Shapiro is overlapped. It should be clear that one skilled in the art would not look to combine Woods with Shapiro as Shapiro requires symmetric QMF and relies on the symmetry to produce the stated results. See

page 3448, first column, first full paragraph. Woods filters referred to by the Examiner are not symmetrical.

Regardless of the above limitations in the cited combination, the present invention claimed in Claim 1 requires context modeling of bits of coefficients generated by an overlapped reversible wavelet transform, where the context modeling is based on known coefficients in other frequency bands and neighboring coefficients in the same frequency bands. The Examiner set forth that Shapiro does not explicitly provide for context modeling bits of coefficients based on known coefficients in other frequency bands and neighboring coefficients in the same frequency bands. The Examiner goes on to state that it is "possible" that Shapiro provides for neighboring coefficients in the same frequency bands since he uses from anywhere from two to four symbols. However, Applicant respectfully submits that Shapiro does not provide for use of both neighboring coefficients in the same frequency band and known coefficients in other frequency bands.

The Examiner also sets forth the use of neighboring coefficients in the same frequency band as a context is provided by Ormsby, specifically where Ormsby provides for a "neighboring block" "context". However, Ormsby sets forth an arithmetic coder that codes scale and structured vector quantization (VQ) indices. The gray scale VQ indices are coded using one definition of the context while the structure VQ indices are coded using a different definition of the context. The structure indices use a first order Markov context which determines context based on one neighboring block structure index. Thus,

Ormsby only provides for using indices, not coefficients. The indices, which are output from a VQ codebook are arbitrary in nature and could not be considered coefficients to one skilled in the art.

Furthermore, Shapiro sets forth tree coding, and when coding trees, all neighboring coefficients may not be available when the coefficients is a given subband are not coded in order. For instance, when coding all levels of the transform at the same time, only the parent coefficients are coded in order. When the parent and children of a tree are to be coded, the children of other parents that might be in the same subband are not used for coding when they have not been coded themselves. That is, if a child or grandchild are not coded (and not part of a zero tree), then they are not used as a context. Whether a child, grandchild, their presence or lack of presence in a zero tree determines whether they are used for coding. In view of this, one skilled in the art would not look to include the use of neighboring coefficients on the frequency band because of the added complexity of determining which of the neighboring coefficients may be used or not used because of whether or not they are part of a zero tree.

Lastly, the Examiner appears to be arguing that the motivation to combine the Shapiro and Ormsby references stems from the fact that both show arithmetic coders and that because Ormsby shows an improvement, one of ordinary skill in the art would be motivated to include Ormsby's arithmetic coder in the Shapiro system. Applicant respectfully disagrees. The test is whether the Shapiro reference shows a motivation or suggestion to

combine with the teaching in Ormsby. There is nothing in Shapiro that indicates or suggests using neighboring coefficients in the same frequency band when context modeling bits of coefficients. Any improvement Ormsby makes with respect to the classic arithmetic coding is used solely in setting forth a system that may be used with the vector quantization codebook and a lapped orthogonal transform (LOT), neither of which are mentioned in the Shapiro reference. Therefore, Applicant respectfully submits that one skilled in the art would not combine the teachings of Ormsby with that of Shapiro. It appears the Examiner is doing no more than using hindsight to select different items from a variety of references in an attempt to create a combination. This is clearly not permissible. In view of this, Applicant respectfully submits the present invention as claimed is not obvious in view of the combination of Shapiro, Woods and Ormsby.

With respect to Claim 23, Applicants wish to further point out that the claim also sets forth that the embedded coder produces the coded data as the series of coefficients are received. This is clearly distinct from Shapiro in that Shapiro completes multiple passes to performing coding operations. In view of this and the argument set forth above, Applicant respectfully submits that Claim 23 is not obvious in view of the combination of Shapiro, Woods and Ormsby.

With respect to Claim 25, the Applicant sets forth a reversible 2,10 wavelet transform which is not shown in the prior art. Therefore, it would not be a variation of a filter that is conventional and specifically the fact that

the Applicant recites "the use of a single fixed high/pass filter is not required" provides no support for the saying that such a filter is obvious. Applicant respectfully submits that a 2,10 reversible wavelet transform filter is not obvious and such a filter has not been shown in any of the references cited by the Examiner.

The Examiner also rejected Claims 25-31, 41 and 43 under 35 U.S.C. §103 as being unpatentable over Shapiro, Woods, Ormsby and further in view of Hartung, et al. or Shinichi. Applicant respectfully submits that neither Hartung nor Shinichi sets forth a reversible 2,10-transform. In view of this, Applicant submits that the present invention is not obvious in view of the cited combination for the same reasons set forth above.

Examiner rejected Claims 38-40 and 42 under 35 U.S.C. §103 as being unpatentable over Shapiro in view of Woods or in the alternative in view of Woods, and further in view of Hartung, et al. or Shinichi. Applicant respectfully submits that the present invention as claimed is not obvious in view of the combination of either of the cited combinations for the same reasons set forth above.

Accordingly, Applicant respectfully submits that the rejections under 35 U.S.C. §103 have been overcome by the amendments and the remarks and withdrawal of these rejections is respectfully requested. Applicant submits that Claims 1, 4-8, 12-13, and 15-43 as amended are now in condition for allowance and such action is earnestly solicited.

Please charge any shortages and credit any overcharges to our Deposit Account No. 02-2666.

Respectfully submitted,
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Dated: 3/4, 1999

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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231 on [redacted] March 8, 1999

Angela M. Quinn — March 8, 1999
Date